Day 2
Go To Class

- Intro to Graphs in 3D
  - Sketch 8 graphs you know by heart – no graphing calculator
  - Shifting
- What happens in 3D?
  - In 2D for each input (x) the output (y) tells you how far to go up or down
  - In 3D inputs are (x,y) pairs and the output(z) tells you how far to move up or down.
  - Is the result still a "wire" or is it a "surface"?
  - In 2 – D, when you didn't know what a graph looked like, you may have plotted points and then connected the dots (trusting the graph went thru all the points between the values you plotted)
  - What to do in 3D? Plot points? Not good.
  - Helps to look at cross – sections.
- Cross sections of some 3D objects
  - Cross sections of 3D objects are 2D
  - Cross Sections of Everyday Objects.
    - Book
    - Can, Cup
    - Basketball, Football
- Now I'll tell you what the cross sections look like and you tell me what the object looks like.
  - Slices || to floor(Horizontal cross sections) same size squares all the way from top to bottom and slices || to each wall(Vertical Cross sections) same size squares.
  - Slices|| to floor (Horizontal cross sections) are Circles smallest at the bottom, largest at the top, and slices || to each wall (Vertical Cross sections) are triangles

  You Try It
  Write a sentence describing the cross sections of a triangular prism.
  Link to Discussion

- Cross Sections of 3-D functions given as equations
  Consider the graph of $z = x^2 + y^2$
  - Graph the function in the Free 3D Plotter
  - Start with horizontal Cross Sections
    - Intersect the graph with planes parallel to the xy plane.
    - Planes parallel to the xy plane have equation z = constant.
    - Intersection are circles, centered at the origin, with radius getting larger as we go up the z – axis.
  - What about the vertical cross sections?
    - Intersect the graph with planes parallel to the yz plane.
    - Planes parallel to the yz plane have equation x = constant.

        - Intersection are parabolas shifting up the z axis as x gets further from the yz plane.
        - Intersect the graph with planes parallel to the xz plane.
        - Planes parallel to the xz plane have equation y = constant.
        - Intersections are parabolas shifting up the z axis as y gets further from the xz plane.
    - Cross Sections by hand
        - Vertical Cross Sections
            - x – Cross Sections
                - Hold x constant in equation
                - Draw 2D graph on yz plane
                - Label x values on each curve

You Try It

            - y – Cross Sections
                - Hold y constant in equation
                - Draw 2D graph on xz plane
                - Label y values on each curve

        Link To Discussion Board

        - Horizontal Cross Sections
            - Contour Diagram
            - Hold z constant in equation
            - Draw 2D graph on xy plane
            - Label z values on each curve
            - Each curve is called a level curve in a contour diagram
            - Topographical Map is a Contour Diagram
            - Only choose z values in the range of the function

You Try It
Try Section 12.3 #9

- 3D Graphs you should know by heart
    - Paraboloids – with shifting
    - Spheres
    - Saddles
    - Cylinders
        - Circular cylinder example
        - ID by only 2 variables in the equation instead of 3.
        - Any 2D pic stretched in the missing variable direction.

You Try It
Sketch a graph of $z = e^y$
Link to Discussion Board